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June 10, 2016

RE: Comments on the EPA OPP Draft Biological Evaluations of Chlorpyrifos, Diazinon, and Malathion, Docket identification numbers EPA-HQ-OPP-2008-0850, EPA-HQ-OPP-2008-0351, EPA-HQ-OPP-2009-0317 and EPA-HQ-OPP-2016-0167, 81 Fed. Reg. 21341 (April 11, 2016).

Dear Sir/Madam,

The FIFRA Endangered Species Task Force ("FESTF") is pleased to have the opportunity to comment on the Agency's effort in implementing the Federal Insecticide Fungicide and Rodenticide Act (FIFRA) registration review program of which the subject evaluation is part. We acknowledge the major effort this national biological evaluation has received from the collaboration of the U.S. Environmental Protection Agency (USEPA), the U.S. Fish and Wildlife Service, the National Marine Fisheries (collectively "the Services"), and involvement of U.S. Department of Agriculture, in an attempt to work through the scientific and technical issues related to determining risks of pesticides to federally listed species. Over our almost 20 years of existence, FESTF and its members have learned that there are proven and reliable approaches to data use, aggregation and application that, if completely applied here, would have greatly increased the accuracy, transparency and efficiency of the Agency's draft FIFRA/ Endangered Species Act risk evaluations.

FESTF has a long history of involvement in and experience with the federally listed species and pesticide assessment process, and FESTF's data will bring efficiency, consistency, clarity, transparency and repeatability to the assessment process in ways that are lacking now without it. FESTF submitted data, including listed species data, to the USEPA for use in its FIFRA risk assessments. To complete this work, FESTF responded to USEPA's direction to aggregate, improve, and deliver data relevant to the analysis of federally listed species and pesticides. USEPA and the Services utilized some FESTF data in their mapping and species attribute data assembly. Recently, FESTF's aggregated species data were identified as a source of information available to USEPA and the Services by the National Academy of Sciences (NAS) Panel report (2013, pg. 72). The Services also credited our support to them during their May 18, 2016 presentation to the Pesticide Program Dialogue Committee (PPDC).

Some Members of FESTF are registrants that will be significantly affected by USEPA's biological evaluations, and any subsequent consultations with the Services, as well as all future chemicals. We support means to evaluate such products, so that USEPA-Office of Pesticide Programs (OPP) can effectively and efficiently establish reasonable measures to ensure that federally listed endangered species are protected in a manner that also minimizes the impact of those measures on the pesticide user community. FESTF looks forward to working with USEPA and the Agencies in the future and is committed to contributing to data sources and processes used in the endangered species and pesticide risk assessment process.

Enclosed are FESTF's detailed comments on the methods and data sources used in the subject evaluation by USEPA and our feedback on how to refine such assessments. These comments follow the instructions outlined by the Agency in the April 5, 2016 comment instruction document posted to each chemical's docket. FESTF has devoted a considerable effort to the provision of these comments in hopes of supplying helpful materials to inform the subject and future biological evaluations. We take this opportunity to comment very seriously and appreciate your similar consideration of our views, observations and remarks.

Sincerely,

Adulie R. Frank (for)

Dan Campbell, Chair FESTF Administrative Committee

COMMENTS ON THE DRAFT BIOLOGICAL EVALUATIONS FOR CHLORPYRIFOS, DIAZINON, AND MALATHION

Biological Evaluation Chapters for Chlorpyrifos ESA Assessment, April 2016, https://www.epa.gov/endangered-species/biological-evaluation-chapters-chlorpyrifos-esa-assessment , Docket Identification Number EPA-HQ-OPP-2008-0850

Biological Evaluation Chapters for Diazinon ESA Assessment, April 2016, https://www.epa.gov/endangered-species/biological-evaluation-chapters-diazinon-esa-assessment, Docket Identification Number EPA-HQ-OPP-2008-0351

Biological Evaluation Chapters for Malathion ESA Assessment, April 2016, https://www.epa.gov/endangered-species/biological-evaluation-chapters-malathion-esa-assessment, Docket Identification Number EPA-HQ-OPP-2009-0317

Submitted by the
FIFRA Endangered Species Task Force, LLC
June 10, 2016

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BACKGROUND

These comments are offered by the FIFRA Endangered Species Task Force, LLC ("FESTF"). The FESTF is a consortium of crop protection product and general pesticide product companies. FESTF formed in 1997 to respond to regulatory requirements for federally listed species ("listed") data imposed by the U.S. Environmental Protection Agency (EPA) under FIFRA, and pursuant to the Agency's implementation of its responsibilities under the Endangered Species Act (ESA), including through EPA's registration review program. FESTF investigated means of meeting EPA's pesticide registration requirements, implemented a program to allow member companies to develop and submit data in response to those requirements, and will carry out this program to its completion.

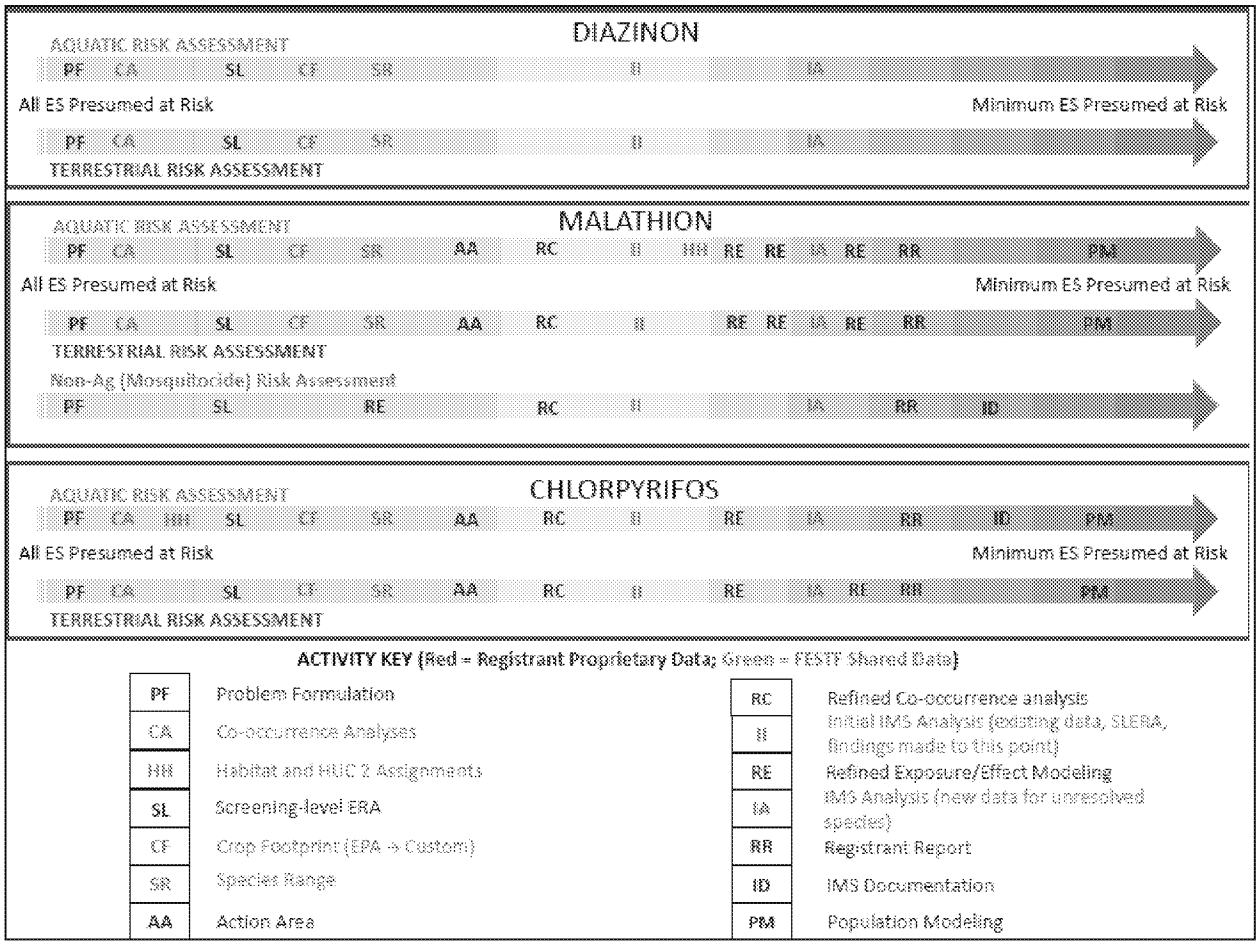
The goal of the project undertaken by FESTF centers around meeting its members' regulatory requirements by improving the consistency, quality, availability and use of existing information on listed species and pesticide use. The foundation of this effort is the development of access to existing information on listed species, as well as a mechanism to consistently process the accessed data for use in the registration and registration review of pesticides by FESTF members. The work products developed by FESTF to meet its members' regulatory requirements are being used in a "case study" conducted by FESTF and affected FESTF-member registrants in parallel to EPA's evaluation of the potential effects to listed species from use of these first three organophosphate (OPs) chemicals. The purpose of the "case study" is to provide existing information on listed species in such a manner that it can help to inform EPA's evaluations in a consistent way. FESTF's case study focused on compiling and analyzing listed species and use site location data both in general and as specific to each of the three OPs under evaluation. Tasks completed to date as part of FESTF's "case study" include

- species range maps using FESTF's aggregated species location data,
- compiling county-level co-occurrences of listed species and potential use sites,
- species presence by hydrological regional boundaries,
- assigning aquatic and aquatic-associated listed species to aquatic "habitat bins,"
- developing spatial crop footprints specific to each OP,
- developing a spatial footprint for the mosquito adulticide use,
- compiling species habitat descriptors and species attribute data (such as natural history, diet, and life cycle), and
- determining listed species presence on federal lands.

Descriptions of these tasks are provided in Attachment 1 and results will be submitted to EPA upon completion of the "case study." Many refinements could be brought into both Steps 1 and 2 to improve exposure predictions and effects profiles and apply general aspects of biological attributes in the assessment to eliminate species from further consideration by assigning a No Effect ("NE") determination based on low probability of occurrence of adverse effects at the appropriate spatial and temporal scales. The "case study" conducted by FESTF and registrants

uses an efficient, logical, reproducible, and scientifically valid process to address a stepwise process of sorting and documenting NE and May Affect "MA" and Likely to Adversely Affect "LAA" and Not Likely to Adversely Affect "NLAA" findings. As can be seen in the figure below, there can be variations in approaches over the life of the assessment, but in the end the documentation and rigor will be commensurate with a uniform approach that produces a meaningful result.

Activity Flow of Registrant and FESTF Case Studies



FESTF acknowledges the immense effort put forth by the EPA, the U.S. Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), and the U.S. Department of Agriculture (USDA) in the development of interim scientific methods to conduct national level pesticide risk assessment for listed species and their designated critical habitats. We also appreciate the consideration of the diverse concerns of the stakeholders affected by or concerned about this process. Having researched and worked closely with this issue for almost 20 years, FESTF offers comments based on this experience and the results, up to this point, of FESTF's "case study." The main themes of our comments fit into suggested topic 2: "Comments on the approach used for Step 1 (making may affect [MA] or no effect [NE] determinations)" and are applicable to all three chemicals under evaluation (chlorpyrifos, malathion, and diazinon).

Comments cover the following subject areas identified in EPA's instructions for commenting on the draft biological evaluations as being "of particular interest": [1]

- Identification of "best available" spatial data to represent potential pesticide use sites and species locations (Attachments 1-2 and 1-3),
- Methods used to identify potential overlaps (and extent) of species locations and potential use sites and their applications in effects determinations made in Steps 1 and 2 (Attachment 1-6),
- Evaluation of mosquito adulticide applications including potential exposure and impact on the aquatic and terrestrial environments (Appendix 3-3 for chlorpyrifos and malathion), and
- "Qualitative" assessments for marine species and cave-dwelling terrestrial species.

COMMENTS

Identification of "best available" spatial data to represent potential pesticide use sites and species locations (Attachments 1-2 and 1-3)

Comment #1: Species location data

As requested by EPA and USFWS for this pilot, the FESTF generated and provided species range maps for each listed species.[2] These range maps included location data refined to the sub-county level obtained from NatureServe, one of the sources of occurrence data identified by the National Academy of Sciences.[3] Other sub-county layers were provided, but it is not clear from the draft biological evaluations if these data were used by EPA or USFWS. FESTF requests clarification on this.

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[1] https://www3.epa.gov/pesticides/nas/instructions.pdf.

[2] See McGaughey, B.; Campana, D.; Frank, A. 2015. Species Maps Using FESTF Aggregated Species Location Data and EPA-Provided Action Area Data - Phase I. Project Number: 15702, 14705. MRID 49575201.; McGaughey, B.; Campana, D.; Frank, A. 2015. Species Maps Using FESTF Aggregated Species Location Data - Phase 2. Project Number: 15703. FIFRA Endangered Species Task Force (FESTF), Lakewood, WA. MRID 49643401.; McGaughey, B.; Campana, D.; Frank, A. 2016. Species Maps Using FESTF Aggregated Species Location Data - Phase 3. Project Number: 15705. FIFRA Endangered Species Task Force (FESTF), Lakewood, WA. MRID 49880801.

[3] National Academy of Sciences. 2013. *Assessing Risks to Endangered and Threatened Species from Pesticides*. Committee on Ecological Risk assessment under FIFRA and ESA, Board on Environmental Studies and Toxicology, Division on Earth and Life Studies, National Research Council. Washington, DC.

Section 1.4.1.2 states that species ranges used in the co-occurrence analysis were provided to EPA in the form of Geographic Information System (GIS) spatial files by the USFWS and NMFS. However, the spatial data files used to assign "May Affect" determinations were not made available in the documents posted by EPA. As such, a thorough analysis of these files as "best available" is not possible. EPA has released neither a subset of their data nor a summary file indicating species presence at even the county level for all species. Attachment 1-6 contains a "SpeciesRegions_DraftBE" worksheet but only very broad region-presence information is provided. State and county presence is provided for some, but not all of the species addressed in this assessment, in the biological information attachments (Attachments 1-11 thru Attachment 1-21), but it is not clear how this geographic range information relates to the species location files received from the Services and used in the overlap analysis in Section 1.4.1.3. FESTF seeks clarification on this.

EPA indicated as recently as the May 9, 2016 Environmental Modeling Public Meeting session[4] that the reason the range maps have not been made available to the public was due to difficulty transferring large file sizes. It is our opinion that this is not an acceptable reason, as FESTF was able to deliver spatial data and maps to USFWS for each listed species, as mentioned above, with relative ease. During the May 9, 2016 EMPM session, EPA presented a web tool to provide visual access to species ranges, but it is currently unavailable as the Agency works to resolve security concerns and maintain updated information. The tool is not expected to provide public access to underlying spatial files that can be used to verify methodology independently. Because data exploration is expected to be largely visually-based, this tool in its finalized form should not be mistaken for full access to species ranges. FESTF requests access to the underlying spatial species location data files used in EPA's draft biological evaluations. FESTF also believes that our efforts to provide the base maps that now in some form are in use by the agencies was undertaken with the understanding that the final, reviewed set of maps would be returned to us for our members' use as well as in support of our willingness to update them on an annual basis as the underlying data changes.

FESTF agrees with CropLife America that the highest resolution data available should be used to represent species range and presence; county-level range data is not considered the "best available" when more refined data are known. In counties where more refined data were not provided by USFWS, FESTF suggests that the refined spatial data provided to EPA from FESTF, referenced in Comment #1 and described in Attachment 1, be used to represent species locations in those counties.

Initial results from FESTF's "case study" illustrate the impact that removing county-level records, where species are not known to occur, has on the scope of the analysis. As part of the "case study", FESTF analyzed county-level locations for each listed species. County-locations are aggregated from a number of different sources, some of which include historical records that are no longer relevant as well as possible locations with unconfirmed records. FESTF found

[4] Presentation entitled "Overlap Tool for May Affect Determinations" presented by Jennifer Connolly, May 9, 2016

evidence over 25% of the total species/county records analyzed fell into this category as supported by species experts, USFWS and NMFS documentation, and other sources[5]. Using this information in Step 1 would remove these irrelevant co-occurrences from further evaluation, saving resources for those co-occurrences actually requiring review.

Comment #2: Species presence by HUC

Species presence by Hydrologic Unit Code region (HUC 2) is provided in Attachment 1-10 but the rationale behind using the coarsest resolution HUCs, representing large watersheds with an average size of 177,560 mi^2 (National Academy of Sciences, 2013),[6] and the methodology supporting these pairings is not provided. Presumably a county or sub-county GIS overlay of HUC regional boundaries against species range was performed, but this is not stated. It is suggested that the rationale behind using this unit and method of assigning species to regional HUCs be explained.

Section 1.4.1.2 in Chapter 1 states that "FWS requested from the species experts in their Regional and Field Offices the most refined range data (e.g., sub-county level where possible) for all listed species under their jurisdiction." Based on the information provided in Attachment 1-10 (worksheet *HUCAssignments*), less than 10% of the species range files used to assign HUCs were refined beyond county. Using county-level range data for over 90% of the species analyzed dramatically over-estimates extent of crop/species overlap and results in avoidable errors of commission, manifested as inaccurate and unrealistic HUC assignments. Examples include:

- Sei Whale (*Balaenoptera borealis*) assigned to HUC 11 and the Sperm Whale assigned to HUCs 6, 11, and 16. These regional HUCs are land-locked, hence not accurate for these marine mammals.
- Spalding's catchfly (*Silene spaldingii*) is a plant endemic to the Palouse region of south-east Washington, Oregon, and Idaho, and is disjunct in northwestern Montana and British Columbia according to the USFWS ECOS Species Profile (http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=Q1P9). This species is incorrectly assigned to HUC 9 which includes parts of Minnesota, North Dakota, and South Dakota.
- The population of the Bull Trout (*Salvelinus confluentus*) federally listed as Threatened occurs in Idaho, Montana, Nevada, Oregon and Washington according to the USFWS ECOS Species Profile (http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=E065). There is an Experimental Population, Non-Essential which occurs in the Northwest Montana Wetland Management District-Flathead County. Neither of these populations occur in the assigned HUC 9 which includes parts of Minnesota, North Dakota, and South Dakota.

[5] A full description of FESTF's "case study" results and support for each finding will be submitted to EPA upon completion of the case study.

[6] Ibid

Comment #3: Potential pesticide use sites - Agricultural

FESTF agrees that the use of the Cropland Data Layer (CDL) to represent potential pesticide use in agriculture is the best available at the national level. However, there are other datasets, from the Washington State Department of Agriculture and the California Farmland Mapping & Monitoring Program, as mentioned by the National Academy of Sciences (2013) report,[7] for example, which would provide more accurate data at the state, regional, or local level.

The classification accuracy of the CDL is generally 85-95% correct for major crop-specific land cover categories but minor crop-specific land cover categories can be much less accurate. FESTF agrees that EPA's method of lumping crop classes from the CDL helps to account for classification uncertainty but FESTF suggests that accuracy information available in the CDL metadata be considered when using the CDL to represent the spatial extent of a given pesticide's potential use area. Statewide accuracy reports are available for all states for each year that the CDL is available from the USDA NASS website, and include accuracy information, including errors of *commission* and *omission* for each cover type. [8] The CLD metadata state that "the "Commission Error" represents when a pixel is included in an incorrect category according to the validation data" and "an "Omission Error" occurs when a pixel is excluded from the category to which it belongs in the validation data." The metadata goes on to state that, "it is important to take into consideration errors of omission and commission." For land cover types with high errors of commission, such as Oats (class 28) in Alabama where the average probability that a pixel from the CDL 2010-2104 classification actually matches the ground-truthed data is 40%, EPA's "region growing" method used in the generation of agricultural use site footprints can exacerbate the impact of such errors and result in a footprint with very high error rates, covering large areas not relevant to the assessment. Minimizing errors of commission, presented as spurious pixels, is recommended[9] (additional comments on the development of agricultural use site footprints are provided in Comment #9). FESTF agrees with CropLife America that accuracy data available from the CDL metadata should also be used to develop a spatially explicit probability distribution of land cover and changes, as suggested in the National Academy of Sciences (2013) report.[10]

Comment #4: Potential pesticide use sites – Non-agricultural

FESTF agrees with CropLife America on the following comments related to spatial datasets representing non-agricultural use sites.

- Appendix 1-6 notes via table footnote that the land cover class "other trees" includes only Christmas trees (with possible misclassification). It is not clear if the land cover class "other trees" was actually utilized to represent the extent of Christmas trees and how the "possible misclassification" was resolved.

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[7] Ibid

[8] For example, see https://www.nass.usda.gov/Research_and_Science/Cropland/metadata/metadata_al14.htm

[9] The GIS tool "Majority Filter" is an option to help minimize spurious pixels in the CDL.

[10] Ibid

- Attachment 1-3 notes that National Land Cover Database (NLCD) Developed or Open Space Developed land use categories were used to spatially represent certain non-agricultural label uses, but it is not clear which non-agricultural label uses are represented by which land use category. Details should be provided for these non-agricultural uses.
- The use site footprints for nursery uses were derived using a proprietary business database, Dun and Bradstreet. It is difficult to evaluate its use and conclusions drawn from the data without the knowledge of what the data look like or the metadata associated with the dataset. Efforts should be made to make this data publicly available. Additionally, the description for this footprint notes that SIC codes "018" and "526" from Dun and Bradstreet were buffered by their facility size. Despite efforts to map production facilities only, this method overstates potential use in nurseries because it includes businesses with no nursery facilities, such as those that are strictly lawn supplies stores, and nursery facilities that do not use pesticides at all.
- Spatially mapped rangeland is the best characterization of the Cattle Ear Tag use. However, tags are used only when pest pressures are high, so minimal off-target exposure is expected. It is suggested that the spatial extent of this use be refined with cattle density information from USDA or the Census of Agriculture Farm Survey to determine the presence of cattle and potential exposure.

Comment #5: Use site presence by HUC 2

Use sites were identified in each HUC 2 using USDA NASS reported acreages (see Appendix 1-6), which was deemed to be the best-available data source. However, even the NASS database has data gaps and based on review of materials available on USDA's Census of Agriculture website and a discussion with Dr. Steve Peterson (USDA-NASS),[11] it is evident that the Census is conducted in such a way that a farmer could farm in various counties but report acreage for a given county where the farm is located. Because of this, the reported acreage gets attributed to one county which could result in acreage that is higher than reality for a given county. Also, for the chlorpyrifos assessment there is a direct contradiction between the report and the table it references in Appendix 1-6 about how to address instances where NASS does not report acreage. According to the report, "If there are no reported NASS cropped acres grown in a particular HUC 2 region, it is assumed that the use did not occur in the HUC." Meanwhile, the corresponding table, Table B 1-6.2. Chlorpyrifos Specific NASS Matrix (2), in Appendix 1-6 includes use sites in a red italic font that represents "No NASS data." The inclusion of these sites in the table implies they are part of the analysis as other use sites are not enumerated in the table.

In the same table, "Developed" land class assignments all point to a footnote which discusses the definition of this class, but does not make an explicit statement about use site presence in

[11] Environmental, Demographics Section, Environmental, Economics, and Demographics Branch, Statistics Division, USDA-National Agricultural Statistics Service (NASS)

the HUCs. Also, there are some dubious land cover types that have been aggregated into this class[12] such as those meant to address cattle and cattle ear tags.

The diazinon Appendix 1-6 incorrectly states that orchards/vineyards occur in all HUCs, but this crop group does not occur in HUC 2 #21 (Puerto Rico)[13].

FESTF suggests these be clarified.

Methods used to identify potential overlaps (and extent) of species locations and potential use sites and their applications in effects determinations made in Steps 1 and 2 (Attachment 1-6)

Comment #6: Consideration of temporal data

FESTF agrees with CropLife America that the co-occurrence analysis should consider temporal aspects of species' behavior. Out of the 112 bird species considered in EPA's draft biological evaluation, 34 species exhibit migratory behavior (see attachment 1-6, Section 9). The migration patterns of these species should be considered in the co-occurrence analysis because migratory species are only present in a given area for a limited duration and thus may not overlap with the action area when a pesticide is applied.

Comment #7: Agricultural use site footprints – Using the label

Appendix 1-6 describes that label limitations and geographic use restrictions (e.g., many diazinon uses are only allowed in Texas) were taken into consideration when modeling HUC 2 regions but there is no indication that these limitations and restrictions were considered when developing crop footprints. Pesticides are labeled for use in specific crop systems and therefore cannot be used on crops not specified on the label.

Crop footprints for each OP were generated as part of FESTF's "case study" with the consideration of labeled crops and geographic use restrictions (see Attachment 1). The "case study" found that EPA's crop group "Pasture/Hay/Forage" contains eight different CDL values

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[12] From Table B 1-6.1: Developed includes: BEEF/RANGE/ FEEDER CATTLE (MEAT)/ DAIRY CATTLE (NON-LACTATING) – ear tags, COMMERCIAL/INSTITUTION-AL/ INDUSTRIAL PREMISES/ EQUIP. (OUTDOOR) – broadcast, crack and crevice/void, CONIFERS AND DECIDUOUS TREES; PLANTATION, NURSERY, DOMESTIC DWELLINGS OUTDOOR PREMISES, FOOD PROCESSING PLANT PREMISES (NONFOOD CONTACT) – crack and crevice, GOLF COURSE TURF, MOSQUITO CONTROL, NONAGRICULTURAL OUTDOOR BUILDINGS/STRUCTURES, SEWER Manhole covers and walls, UTILITIES – broadcast, WIDE AREA/ GENERAL OUTDOOR TREATMENT – broadcast, drench, WOOD PROTECTION TREATMENT TO BUILDINGS/PRODUCTS OUTDOOR, ORNAMENTAL AND/OR SHADE TREES, HERBACEOUS PLANTS, RECREATIONAL AREAS, RIGHTS OF WAY, ROAD MEDIANS, NON- FLOWERING PLANTS, ORNAMENTAL WOODY SHRUBS AND VINES, ORNAMENTALS

[13] However, the text later admits that information is incomplete for HUC 2s #20 and 21

(Alfalfa, Other Hay/Non Alfalfa, Switchgrass, Pasture/Grass, Grassland Herbaceous, Grassland/pasture, Pasture/Hay, Vetch) but chlorpyrifos is only labeled for use on Alfalfa, and not the other seven CDL values. Using all eight values to represent the spatial extent of potential chlorpyrifos use in alfalfa overestimates coverage by 62%. Similarly, chlorpyrifos is not labeled for use on cotton in the state of Mississippi; excluding cotton in Mississippi from the crop footprint removes over 1.2 million acres of cotton[14].

FESTF suggests that EPA revise the crop footprints by taking into account geographic use restrictions as well as excluding crops not labeled for use. Such revisions will provide a much more accurate footprint since it removes areas and crops not labeled for use and in turn will result in fewer species to be addressed beyond Step 1.

Comment #8: Agricultural use site footprints – Crop grouping

EPA presented in the April 15, 2015 EPA ESA Stakeholder workshop slides on reducing uncertainty in the development of crop footprints and noted that high-confidence crops (major crops such as corn) are represented individually but that lower-confidence crops (minor crops such as vegetables) are represented by groups. FESTF agrees that this provides a sufficient level of certainty that a potential co-occurrence is not overlooked due to errors in the CDL, but it significantly decreases efficiency of analysis at the species level by overstating potential co-occurrence. For example, grouping grapes (class 69) into the *Orchard/vineyards* crop group with 17 other crops (see Attachment 1-2) overstates the spatial extent of grapes by more than 75%. For an analysis of a particular chemical's use in grapes, this would generate many more co-occurrences needing evaluation than if grapes only were used to represent the spatial extent. There are many crops, such as cranberries, that require very specific conditions and grow only in small parts of the country (e.g., ~80% of all cranberries are produced in MA and WI). According to Attachment 1-2, cranberries are grouped with 41 other classes for the *Vegetables and Ground fruit* crop group but given their specific growing conditions and limited growing area, it is unlikely cranberries will be found in the same region as many of the other vegetables and ground fruit. FESTF suggests that the crop groupings be examined and further split to take into account agronomic factors such as growing conditions, climate and soil requirements, etc.

Comment #9: Agricultural use site footprints – "Region growing"

It is noted in Attachment 1-3, "Method for Establishing the Use Site Footprints," for the Cropland Data layer (CDL), "several methods have been employed to minimize data errors within the CDL." It is commonly known that each CDL dataset contains small areas that are misclassified as agricultural land (just one type of "data error" in the CDL data), which have also been referred to as "spurious pixels" as described in Comment #3 above. These are individual or a few pixels assigned a land use that is inconsistent with their location (such as one pixel on the shore of a pond that is classified as a particular crop). When multiple CDL datasets are

[14] Acreage value is based on pixel count from aggregated CDL 2010-2014 cotton crop group in Mississippi.

aggregated, the spurious pixels (which are typically in different places for each dataset) can artificially expand the use site footprint and result in use site areas outside the true agricultural land footprint.

The method used by the EPA for adjusting the crop footprint to align with the Census of Agriculture harvested acres is described as follows (Attachment 1-3, page 1):

> "The agricultural classes were further refined by comparing county level National Agricultural Statistics Service (NASS) 2012 Census of Agriculture (CoA) acreage reports to county level CDL acreages. The CDL acreages represent the temporally aggregated and categorically grouped processing steps previously described, summarized at the county level. If a county's CDL acreage for a given class was lower than the NASS acreage, the CDL class's extent was expanded within cultivated areas until the CDL acreage matched the NASS CoA. Using the temporally and thematically aggregated CDL as an input, a script was developed that compares each CDL crop group in each county to the corresponding NASS CoA acreage report. If the CDL acreage was less than NASS, the raster was expanded in 1 pixel iterations until the NASS acreage value was reached, or the area within the cultivated mask was built out. Region growing was restricted using the most recent CDL Cultivated Layer as a mask (2014), so as to avoid buffering into any non-agricultural land cover types. This method reduced land cover mapping errors by adjusting the extent of each category to the most recent CoA values, in this case, 2012."

The CDL 2014 Cultivated Layer[15] used in the Biological Evaluations as a mask for limiting the use site expansion has the following Process Step definition:

> "The 2014 Cultivated Layer is based on the most recent five years of CDL data (2010-2014). An Erdas Imagine Spatial Model is used to create the Cultivated Layer. The processing logic is as follows. If a pixel is identified as cultivated in at least two out of the five years of CDL data, then it is assigned to the 'Cultivated' category. The exception is that all pixels identified as cultivated in the most recent year are assigned to the 'Cultivated' category regardless of whether or not they were cultivated in the previous four years of CDL data."

According to the process definition, the CDL 2014 Cultivated Layer contains all the misclassified pixels (spurious pixels) for the 2014 data year, without any refinement or validation for actual true crop use areas. Therefore, using the CDL 2014 Cultivated Layer as a cultivated land mask to adjust for land cover mapping errors clearly includes known errors in the resulting adjusted land use areas. When "refining" a dataset, the same dataset containing known errors should not be used as mask; this process inherently propagates known data errors. Additionally, as

[15] In the memo, "Response to a Request for Comment Period Extension: Notice of Availability of Draft Biological Evaluations of Chlorpryrifos, Diazinon, and Malathion (81 Fed. Reg. 21341 (April 11, 2016))", Appendix B, it was noted that 2015 CDL was used as a mask and 6 years of CDL data (2010-2016) were aggregated for the footprints.

mentioned in Comment #3 above, manner of acreage reporting in the Census of Agriculture could result in a spatial extent much larger than appropriate when applying the 'region growing' method. FESTF suggests that UDSA provide input about how to account for this in the development of agricultural use site footprints, and that USDA NASS specifically be given a role in improving EPA's use of NASS cropland data.

FESTF agrees with CropLife America that a more suitable dataset to use for the cultivated mask would be the high-quality National Land Cover Dataset (NLCD) 2011, in which land use data have been validated, and spurious pixels removed from areas that cannot support agriculture. The NLCD 2011 has been relied upon for non-agricultural land use types in these evaluations, so the use of this dataset should be acceptable. Further, if the NLCD 2011 Cultivated Crops (Class 82) and Pasture/Hay (Class 81) could be used as a general refinement for the aggregated CDL for crops and hay/forage production, then the spurious pixel problems within the CDL datasets may be greatly reduced, resulting in a use site footprint that is more consistent with actual land use.

FESTF recreated the CDL Processing Python Scripts found in Appendix B of the memo posted to 81 Fed. Reg. on April 11, 201616. While we do not have the datasets that EPA used with the scripts, our application resulted in county acreage and county portrayals that do not seem to achieve the goal stated by EPA for their process. Additionally, CDL data already contains 3 million more acres of cropland in the Orchards/Vineyards crop group than what is reported in the Census of Agriculture for the same crops. FESTF would like to discuss our findings and experience with EPA as future opportunities permit.

Comment #10: Aquatic Bin Assignments

As mentioned above, FESTF is currently working through a "case study" in parallel to EPA's on the three pilot chemicals. One task completed as part of FESTF's case study was the assignment of aquatic and aquatic-associated listed species into the 10 aquatic habitat bins presented in Chapter 1, Table 1-7. Generic Aquatic Habitats (chlorpyrifos) (see Attachment 1 for a description of this task). A comparison of FESTF's assignments with EPA's from Attachment 1-10, identified that the species in Appendix 1 were assigned to Bin 5 (Low Flow) by EPA but information is available to support the fact that they do not occur in Bin 5. Differences between FESTF's assignments and EPA's in other Bins exist but Bin 5 is commented upon here because it is used in AgDrift as the smallest static aquatic bin. FESTF recommends review of this information and revision of bin assignments.

Comment #11: Presence on Federal Lands

FESTF observed in many of the species attribute attachments (Attachment 1-11 thru 1-21), EPA cited a database submitted by FESTF to EPA on the coincidence of federally listed species on

[16] Ibid

Federal Lands[17] and is pleased to see EPA using this information. FESTF has updated the database submitted in 2012 using a more recent licensed dataset from NatureServe and plans to submit it in the very near future; if EPA would like access to this database prior to its formal submission, that easily can be arranged.

Initial results from FESTF's "case study" illustrate the impact that removing county-level records, where species reside wholly within lands owned and managed by federal landholders, has on the scope of the analysis. As part of the "case study", FESTF analyzed county-level locations for each listed species in relation to federal and Indian lands because species are afforded protection on such lands by the federal landholder. For 216 species/county co-occurrences, all occurrences of the species in question resided wholly on these lands supported by an updated version of the database cited by EPA in the species attribute attachments[10] or USFWS and NMFS documentation. All of the locations for 7 species were found to be wholly residing on federal or Indian lands. Using this information in Step 1 would remove these co-occurrences from further evaluation, saving resources for those co-occurrences actually requiring it.

Comment #12: Species Attributes

FESTF maintains information aggregated from various sources on federally listed species habitat, life history, diet, and other attributes (see Attachment 1 for a description) and recognizes the major effort required to prepare the species attribute attachments in EPA's draft biological evaluations (Attachments 1-11 thru 1-21). FESTF maintains a similar database of aggregated species attribute data (see MRID 49643402[18]) which was used in the "case study" to compile habitat, life history, diet and other species' characteristics. An analysis of this information resulted in removing a total of 6,357 species/county co-occurrence records from further consideration. Included in this were all of the records for 102 species. Examples include species found only in high elevation habitats, deep within forests, in deep ocean waters, and other unique characteristics and habitat attributes that would preclude exposure from the use of OPs. FESTF recommends using the attribute data compiled by EPA as well as that compiled by FESTF and submitted (see MRID 49643402[19]) in Step one to remove such co-occurrences from further evaluation.

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[17] FESTF. 2012. Coincidence of ESA-listed species with federal lands and proximity to outer boundary. FIFRA Endangered Species Task Force. Data submitted to EPA March 2012.

[18] Frank AR. 2015. Listed Species Data Aggregated by the FIFRA Endangered Species Task Force – 2013 and 2014 Updates. Project Number 13716. FIFRA Endangered Species Task Force (FESTF), Lakewood, WA. MRID 49643402.

[19] Ibid

Evaluation of mosquito adulticide applications including potential exposure and impact on the aquatic and terrestrial environments (Appendix 3-3 for chlorpyrifos and malathion)

Comment #13

The potential use site footprint for mosquito control was not spatially defined and is assumed by EPA to be in every HUC and every watershed. However, one of the work tasks completed as part of FESTF's "case study" was development of a spatial footprint representing the malathion adulticide use. For this footprint, data were obtained from the American Mosquito Control Association, registrants, and mosquito control districts indicating at the county and sub-county level where applications of malathion adulticide take place. This covered 159 counties were applications had been reported by one of the sources. To this, 514 neighboring counties were added to account for potential drift, totaling 673 counties. Attachment 1 provides a more detailed description of this task. This is a much more realistic spatial footprint representing mosquito control use and it is recommended that these data, and similar data for other chemicals, are taken into consideration when developing a spatial footprint for mosquito control.

"Qualitative" assessments for marine species and cave-dwelling terrestrial species.

Comment #14

FESTF agrees that a qualitative assessment for marine species is appropriate and can be a useful tool to improve efficiency, but does not agree with the "Likely to Adversely Affect" determination made for Guadalupe fur seal, southern sea otter, Steller sea lion, Hawaiian monk seal, Pacific harbor seal, and West Indian Manatee and their critical habitats, where designated. These species are very mobile and it is extremely unlikely any of these species will consume a sufficient amount of pesticide residue from their diets from these Bins (the manatee is likely to consume most of its diet in fresh water but not much (if any) in the smaller aquatic bins). Also, sea turtles are very unlikely to use tidal pools that are the size of Bin 5 for longer than a few minutes and these tidal pools will not last for more than 12 hrs. FESTF located one reference document noting that Green Sea turtles can be found in fresh water.[20] In this one instance, Green Sea turtles were found in the lower three miles of the San Gabriel River, which besides having some mixing with fresh water would be large enough to not fit a small aquatic Bin.

Other Comments

Comment #15

The document cited in Chapter 1 used for evaluating spray drift distances (see footnote #17 in the Section 1.4.1.1.c.2 in the chlorpyrifos evaluation) is a "draft for comment" guidance, not final guidance. The citation should be amended to indicate the draft nature of the guidance document.

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[20] http://www.scpr.org/news/2015/02/19/49901/green-sea-turtles-in-the-san-gabriel-river-scienti/

Comment #16

In Appendix 3-2 (Fate Open Literature), for many of the citations, the journal name is not included in the citation. This appears to be a systematic error in the preparation of the citation list from a reference manager software tool. This does not appear to be an issue for Appendix 3-2 in the Malathion evaluation.

In Appendix 2-3 (Toxicity Open Literature Reviews), the journal name is also missing from several ECOTOX citations.

Appendix 1. Species assigned to Bin 5 by EPA in Attachment 1-16 for which information exists to support removing species from Bin 5

Species common name	Species scientific name	Rationale	References
Cape Sable seaside sparrow	*Ammodramus maritimus mirabilis*	The Cape Sable seaside sparrow is a terrestrial species that habits seasonally flooded interior waters (USFWS, 1999). It does not inhabit the actual water, but is dependent on flooding for habitat. In addition, if the area is seasonally flooded from rain it will be bigger than Bin 5.	U.S. Fish and Wildlife Service. 1999. South Florida multi-species recovery plan. Atlanta, Georgia. 2172 pp.
Red knot	*Calidris canutus rufa*	This is a wading bird that feeds in the sands of estuaries and coastlines (USFWS, 2016). If the bird is on the sand out of the water, it is not in an aquatic bin. If it is going to be in the water, it is going to be in a much larger habitat than Bin 5, OR it is going to be temporary (i.e., tidal or perhaps from waves).	U.S. Fish and Wildlife Service. 2016. Rufa Red Knot (*Calidris canutus rufa*) [threatened]. New Jersey Field office. Found on-line on May 24, 2016 at http://www.fws.gov/northeast/njfieldoffice/endangered/redknot.html
Warner sucker	*Catostomus warnerensis*	This species inhabits lakes and streams of the Warner Valley (USFWS, 1998). Lakes are Bin 6, not Bin 5.	U.S. Fish and Wildlife Service. 1998. Recovery Plan for the Native Fishes of the Warner Basin and Alkali Subbasin. Portland, Oregon. 86 pp.
Hiko White River springfish	*Crenichthys baileyi grandis*	The Springs where this species is present are larger than what would be associated with this bin (species is in Ash Springs, Nevada; USFWS, 2014 and Compliance Services International staff personal observation). The main springs (Hiko, Ash, Crystal) are all much too large for Bin 5 (people swim in Ash Spring). The Hiko River Springfish, according to the Recovery Plan (USFWS, 2014) occurs in Crystal and Hiko (restocked) springs, and Blue Link spring and reservoir, also much too large for Bin 5.	U.S. Fish and Wildlife Service. 2014. Hiko White River springfish (*Crenichthys baileyi grandis*). Nevada Fish and Wildlife Office. Found on-line on May 24, 2016 at http://www.fws.gov/nevada//protected_species/fish/species/hiko_wr_springfish.html
Beautiful shiner	*Cyprinella formosa*	This species inhabits pools of medium to small streams and has been introduced into man-made ponds (among other habitats) (USFWS, 1994). These are not Bin 5.	U.S. Fish and Wildlife Service. 1994. Yaqui Fishes Recovery Plan. USD1 Fish and Wildlife Service, Albuquerque, New Mexico. 48 pp.

Species common name	Species scientific name	Rationale	References
Leon Springs pupfish	*Cyprinodon bovinus*	This is a spring species (spring owned by the Nature Conservancy). Leon springs is shallow, but it flows for a considerable length and is larger than Bin 5 (Compliance Services International staff personal observation; USFWS, 1985).	U.S. Fish and Wildlife Service. 1985. Leon Springs Pupfish Recovery Plan. Prepared by the Rio Grande Fishes Recovery Team. USFWS, Albuquerque, New Mexico.
Comanche Springs pupfish	*Cyprinodon elegans*	This is a spring species (found in a State Park). Upon its listing, this species was known only from irrigation ditches. EPA provided funds, along with Texas, to develop an artificial cienega for the pupfish at Balmorhea state park (USFWS, 2013). (EPA & Texas won a conservation award for this.) Neither the artificial cienega, nor the irrigation ditch are Bin 5.	U.S. Fish and Wildlife Service. 2013. Comanche Springs Pupfish (Cyprinodon elegans) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service Austin Ecological Services Field Office Austin, TX.
Ash Meadows Amargosa pupfish	*Cyprinodon nevadensis mionectes*	This is a spring species (USFWS, 1990). The springs at Ash Meadows NWR are all larger than Bin 5 and flow for a considerable length (longer than Bin 5) (Compliance Services International staff personal observation).	U.S. Fish and Wildlife Service. 1990. Recovery plan for the endangered and threatened species of Ash Meadows, Nevada. U.S. Fish and Wildlife Service, Portland, Oregon. 123 pp.
Warm Springs pupfish	*Cyprinodon nevadensis pectoralis*	This is a spring species (USFWS, 1990). The springs at Ash Meadows NWR are all larger than Bin 5 and flow for a considerable length (longer than Bin 5) (Compliance Services International staff personal observation).	U.S. Fish and Wildlife Service. 1990. Recovery plan for the endangered and threatened species of Ash Meadows, Nevada. U.S. Fish and Wildlife Service, Portland, Oregon. 123 pp.
Owens pupfish	*Cyprinodon radiosus*	This species has been introduced into several areas including two spring fed ponds that are described as .01 acre ponds, .01 acres is 435 sq feet which is bigger than the Bin 5 water body. (Note: All of the original water in the Owens river went to Los Angeles).	U.S. Fish and Wildlife Office. 2009. Owens Pupfish (Cyprinodon radiosus) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service Ventura Fish and Wildlife Office Ventura, California.
Golden-cheeked warbler (=wood)	*Dendroica chrysoparia*	This species inhabits very dry habitats (occurs in Ashe juniper) and is not a ground dweller (USFWS, 1992). Not a Bin 5 species.	U.S. Fish and Wildlife Service. 1992. Golden-cheeked Warbler (Dendroica chrysoparia) Recovery Plan. Albuquerque, New Mexico. 88 pp.

Species common name	Species scientific name	Rationale	References
Eastern indigo snake	*Drymarchon corais couperi*	This species may occasionally traverse a wet field (USFWS, 1982), but based on the amount of rain per rainfall event in Florida these areas would be larger than Bin 5.	U.S. Fish and Wildlife Service. 1982. Eastern Indigo Snake Recovery Plan. Atlanta, Georgia. 23 pp.
Purple bankclimber (mussel)	*Elliptoideus sloatianus*	This species inhabits flowing water (large rivers and streams) (USFWS, 2003). Not a Bin 5 species.	U.S. Fish and Wildlife Service. 2003. Recovery Plan for Endangered Fat Threeridge (Amblema neislerii), Shinyrayed Pocketbook (Lampsilis subangulata), Gulf Moccasinshell (Medionidus penicillatus), Ochlockonee Moccasinshell (Medionidus simpsonianus), and Oval Pigtoe (Pleurobema pyriforme); and Threatened Chipola Slabshell (Elliptio chipolaensis), and Purple Bankclimber (Elliptoideus sloatianus). Atlanta, Georgia. 142 pp.
Pahrump poolfish	*Empetrichthys latos*	All known populations of this poolfish have been introduced (three populations). These introduced areas are bigger than Bin 5 (Corn Creek Spring on the Desert National Wildlife Range, north of Las Vegas, Nevada; Shoshone Springs southeast of Ely, Nevada; and in an irrigation reservoir at Spring Mountains Ranch State Park west of Las Vegas, Nevada) (USFWS, 1980).	U.S. Fish and Wildlife Service. 1980. Pahrump Killifish Recovery Plan. Prepared by the U.S. Fish and Wildlife Service in Cooperation with the Recovery Team.
Southern sea otter	*Enhydra lutris nereis*	This species inhabits coastal areas of the ocean (along with bays and inlets) (USFWS, 2014).	U.S. Fish and Wildlife Service. 2014. SOUTHERN SEA OTTER (Enhydra lutris nereis) U.S. Fish and Wildlife Service, Ventura, California. Found on-line on May 24, 2016 at https://www.fws.gov/ventura/docs/species/sso/SSO%20Final%20SAR%202014%201-22.pdf
Northern riffleshell	*Epioblasma torulosa rangiana*	Species requires flowing water (USFWS, 1994). Not found in Bin 5.	U.S. Fish and Wildlife Service. 1994. Clubshell (Pleurobema clava) and Northern

Species common name	Species scientific name	Rationale	References
			Riffleshell (Epioblasma torulosa rangiana) Recovery Plan. Hadley, Massachusetts. 68 pp.
Snuffbox mussel	*Epioblasma triquetra*	This species is found in riffles of small and medium creeks and large rivers and shoals and wave-washed shores of lakes (USFWS, 2012). Lakes are not Bin 5.	U.S. Fish and Wildlife Service. 2015. Snuffbox (freshwater mussel) Epioblasma triquetra. Fact sheet. Found on-line on May 24, 2016 at https://www.fws.gov/midwest/Endangered/clams/snuffbox/SnuffboxFactSheet.html
Desert dace	*Eremichthys acros*	The spring pools this species inhabits are larger than Bin 5 (USFWS, 1997).	U.S. Fish and Wildlife Service. 1997. Recovery Plan for the Rare Species of Soldier Meadows. Portland, Oregon. 50 pp.
Tidewater goby	*Eucyclogobius newberryi*	There is no evidence this species is ever found in Bin 5 (tidewater pools are temporary (USFWS, 2005) and not subject to pesticide use).	U.S. Fish and Wildlife Service. 2005. Recovery Plan for the Tidewater Goby (Eucyclogobius newberryi). U.S. Fish and Wildlife Service, Portland, Oregon. vi + 199 pp.
Unarmored threespine stickleback	*Gasterosteus aculeatus williamsoni*	When the species is found in standing water (backwaters of streams), the standing water is larger than Bin 5 (USFWS, 1985).	U.S. Fish and Wildlife Service. 1985. Unarmored Threespine Recovery Plan (Revised). U.S. Fish and Wildlife Service, Portland, Oregon. 80 pp.
Hutton tui chub	*Gila bicolor ssp.*	The springs that this species inhabits are larger than Bin 5 (Hutton spring and unnamed spring the un-named spring is the smaller of the 2 and is 3 meters in diameter and 0.74 meters deep) (USFWS, 1998).	U.S. Fish and Wildlife Service. 1998. Recovery Plan for the Native Fishes of the Warner Basin and Alkali Subbasin. Portland, Oregon. 86 pp.
Mohave tui chub	*Gila bicolor ssp. mohavensis*	The smallest pool/spring this species inhabits is 3 m in diameter and 3 m deep (USFWS, 1984).	U.S. Fish and Wildlife Service. 1984. Recovery Plan for the Mohave Tui Chub, Gila Bicolor Mohavensis. U.S. Fish and Wildlife Service. Portland, Oregon. 56 pp.

Species common name	Species scientific name	Rationale	References
Yaqui chub	*Gila purpurea*	Occurs in San Bernardino Wildlife Refuge along the Mexican border. From the 1994 Recovery Plan: "Yaqui chub live in deep pools in creeks, scoured areas of cienegas and other stream-associated, quiet waters." "Deep pools" do not qualify as Bin 5.	U.S. Fish and Wildlife Service. 1994. Yaqui Fishes Recovery Plan. USD1 Fish and Wildlife Service, Albuquerque, New Mexico. 48 pp.
Louisiana quillwort	*Isoetes louisianensis*	This is a stream dwelling species (USFWS, 1996). Not a Bin 5 species.	U.S. Fish and Wildlife Service. 1996. Recovery Plan for Louisiana quillwort (Isoetes louisianensis Thieret). Atlanta, Georgia. 26 pp.
Higgins eye (pearlymussel)	*Lampsilis higginsii*	Large river species (USFWS, 2004) not associated with Bin 5.	U.S. Fish and Wildlife Service. 2004. Higgins Eye Pearlymussel (Lampsilis higginsii) Recovery Plan: First Revision. Ft. Snelling, Minnesota. 126 pp.
Arkansas fatmucket	*Lampsilis powellii*	Species is found in deep pools of medium to small rivers (USFWS, 1992), these areas are not considered Bin 5.	U.S. Fish and Wildlife Service. 1992. Arkansas Fatmucket Mussel (Lampsilis powelli) Recovery Plan. U.S. Fish and Wildlife Service. Jackson, Mississippi. 19 pp.
Shinyrayed pocketbook	*Lampsilis subangulata*	This species is not associated with Bin 5. This species is found in flowing water. The occurrence in 'Dead Lake' which is a flow-through river-lake is a large body of water (USFWS, 2003).	U.S. Fish and Wildlife Service. 2003. Recovery Plan for Endangered Fat Threeridge (Amblema neislerii), Shinyrayed Pocketbook (Lampsilis subangulata), Gulf Moccasinshell (Medionidus penicillatus), Ochlockonee Moccasinshell (Medionidus simpsonianus), and Oval Pigtoe (Pleurobema pyriforme); and Threatened Chipola Slabshell (Elliptio chipolaensis), and Purple Bankclimber (Elliptoideus sloatianus). Atlanta, Georgia. 142 pp.
Birdwing pearlymussel	*Lemiox rimosus*	This species is not associated with Bin 5. This species is found in flowing water (small to medium sized rivers) (USFWS, 1983).	U.S. Fish and Wildlife Service. 1983. Birdwing Pearly Mussel Recovery Plan. U.S. Fish and Wildlife Service. Atlanta, Georgia. 56 pp.

Species common name	Species scientific name	Rationale	References
White River spinedace	*Lepidomeda albivallis*	The springs that this species inhabits are larger than Bin 5. One is 300 m2 and the other 75 m2 (Western North American Naturalist, 2004)	U.S. Fish and Wildlife Service. 2014. White River Spinedace (Lepidomeda albivallis). Nevada Fish and Wildlife Office. Found on-line on May 24, 2016 at http://www.fws.gov/nevada/protected_species/fish/species/wr_spinedace.html; Western North American Naturalist. 2014. Found on-line at https://ojs.lib.byu.edu/spc/index.php/wnan/article/viewFile/27878/26341.
Scaleshell mussel	*Leptodea leptodon*	This species inhabits medium to large rivers with low to medium gradients (USFWS, 2010). Not a Bin 5 species.	U.S. Fish and Wildlife Service. 2010. Scaleshell Mussel Recovery Plan (Leptodea leptodon). U.S. Fish and Wildlife Service, Fort Snelling, Minnesota. 118 pp
Gulf moccasinshell	*Medionidus penicillatus*	This species inhabits flowing water (USFWS, 2003). Not a Bin 5 species.	U.S. Fish and Wildlife Service. 2003. Recovery Plan for Endangered Fat Threeridge (Amblema neislerii), Shinyrayed Pocketbook (Lampsilis subangulata), Gulf Moccasinshell (Medionidus penicillatus), Ochlockonee Moccasinshell (Medionidus simpsonianus), and Oval Pigtoe (Pleurobema pyriforme); and Threatened Chipola Slabshell (Elliptio chipolaensis), and Purple Bankclimber (Elliptoideus sloatianus). Atlanta, Georgia. 142 pp.
Paiute cutthroat trout	*Oncorhynchus clarkii seleniris*	This species occurs in miles long reaches in mountainous areas that are too steep to have oxbows (see USFWS, 2013 5-yr review).	U.S. Fish and Wildlife Service. 2013. Paiute Cutthroat Trout (Oncorhynchus clarkii seleniris) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service Nevada Fish and Wildlife Office Reno, Nevada.

Species common name	Species scientific name	Rationale	References
Sheepnose mussel	*Plethobasus cyphyus*	Species inhabits large and medium size rivers and can also occur in reservoirs (USFWS, 2012). Not a Bin 5 species.	U.S. Fish and Wildlife Service. 2012. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the Sheepnose and Spectaclecase Mussels Throughout Their Range; Final Rule. FR. Vol. 77, No. 49. Pages 14914-14949.
Oval pigtoe	*Pleurobema pyriforme*	Species inhabits medium size creeks to small rivers and can also occur in reservoirs (USFWS, 2003). Not a Bin 5 species.	U.S. Fish and Wildlife Service. 2003. Recovery Plan for Endangered Fat Threeridge (Amblema neislerii), Shinyrayed Pocketbook (Lampsilis subangulata), Gulf Moccasinshell (Medionidus penicillatus), Ochlockonee Moccasinshell (Medionidus simpsonianus), and Oval Pigtoe (Pleurobema pyriforme); and Threatened Chipola Slabshell (Elliptio chipolaensis), and Purple Bankclimber (Elliptoideus sloatianus). Atlanta, Georgia. 142 pp.
Gila topminnow (incl. Yaqui)	*Poeciliopsis occidentalis*	This species has been transplanted to many ditches, ponds, and pools (including artificial) (USFWS, 1998). But it occurs in Arizona and any habitat that fits Bin 5 would dry up during the spring or summer, with all the fish dying.	U.S. Fish and Wildlife Service. 1998. GILA TOPMINNOW, Poeciliopsis occidentalis occidentalis, REVISED RECOVERY PLAN. U.S. Fish and Wildlife Service. Albuquerque, New Mexico. 83 pp.
Audubon's crested caracara	*Polyborus plancus audubonii*	The Audubon's crested caracara should not be listed as a Bin 5 species. This raptor inhabits croplands, desert, grasslands, savannas and shrublands (USFWS, 1999).	U.S. Fish and Wildlife Service. 1999. South Florida multi-species recovery plan. Atlanta, Georgia. 2172 pp.
Alabama (=inflated) heelsplitter	*Potamilus inflatus*	This species inhabits flowing water (USFWS, 1992). Not Bin 5.	U.S. Fish and Wildlife Service. 1992. Inflated Heelsplitter, (Potamilus inflatus) Recovery Plan. U.S. Fish and Wildlife Service. Jackson, Mississippi. 15 pp.
Ash Meadows speckled dace	*Rhinichthys osculus nevadensis*	The springs at the Ash Meadows NWR are all larger than Bin 5 and flow for a considerable length, longer than Bin 5	U.S. Fish and Wildlife Service. 1990. Recovery plan for the endangered and threatened species of Ash Meadows,

Species common name	Species scientific name	Rationale	References
		(Compliance Services International staff personal observation and USFWS, 1990).	Nevada. U.S. Fish and Wildlife Service, Portland, Oregon. 123 pp.
Atlantic salmon	*Salmo salar*	The Atlantic salmon inhabits year-round streams (USFWS, 2016). These streams are not Bin 5.	U.S. Fish and Wildlife Service and NOAA-Fisheries. 2016. Draft recovery plan for the Gulf of Maine Distinct Population Segment of Atlantic salmon (Salmo salar). 61 pp.
Buena Vista Lake ornate shrew	*Sorex ornatus relictus*	This is not considered an aquatic mammal, it inhabits the perimeter of Buena Vista Lake and utilize wetland vegetative cover (USFWS, 1998). Not a Bin 5 species.	U.S. Fish and Wildlife Service. 1998. Recovery plan for upland species of the San Joaquin Valley, California. Region 1, Portland, OR. 319 pp.
Flattened musk turtle	*Sternotherus depressus*	Species inhabits streams (USFWS, 1990). Not a Bin 5 species.	U.S. Fish and Wildlife Service. 1990. Flattened Musk Turtle Recovery Plan. Jackson, Mississippi. 15 pp.
Eulachon	*Thaleichthys pacificus*	This species is not found in Bin 5. Nearshore ocean and coastal inlets. Spawns in freshwater streams and rivers (NOAA, 2014).	NOAA Fisheries. 2014. Eulachon (Thaleichthys pacificus). Found on-line on May 25, 2016 at http://www.nmfs.noaa.gov/pr/species/fish/pacificeulachon.htm

Attachment 1. FESTF Work Tasks Completed as Part of FESTF's "Case Study"

In parallel to the US Environmental Protection Agency's pilot study on the first three organophosphates (OPs; malathion, diazinon, chlorpyrifos) through the Registration Review process, the FIFRA Endangered Species Task Force (FESTF) conducted a case study utilizing FESTF's aggregated data and work products. The purpose of the case study conducted by FESTF was to provide the affected FESTF-member OP registrants, as well as the USEPA, with data to inform the endangered species and pesticide risk assessment process. FESTF's case study focused on compiling and analyzing listed species and use site location data both in general and specific to each of the three OPs under evaluation. This document describes tasks that were completed by FESTF as part of the case study that can be utilized by FESTF-member OP registrants and USEPA where appropriate. Although most of these tasks support Step 1 of the Registration Review interim risk assessment process outlined by the USEPA, they may also be relevant to Step 2 and Step 3.

Listed species range data

FESTF maintains a dataset comprised of county and sub-county level locations for species that are federally listed as either endangered, threatened, or proposed for listing under the Endangered Species Act ("ESA-listed species"). Locations from the sources detailed below are aggregated into FESTF's database and are updated on an annual basis (see MRID 49643402 for a description of the aggregation and update process).[21] For each species location, the data source(s) reporting presence in that location is documented and reported. The case study included all species federally listed as endangered, threatened, or proposed for listing as of August 11, 2014.

At the request of EPA and USFWS, FESTF generated and submitted to EPA range maps for all listed species for use in their pilot assessment (MRID 49575201,[22] 49643401,[23] 49880801[24]). At the time of FESTF's case study, the final range maps utilized by EPA and USFWS were unavailable. Based on FESTF's aggregated species location data analysis, ~60% of all reported/known species locations do not have a spatial component (i.e., sub-county location data in a spatial format is not available). To create range data for each ESA-listed species representing locations from all sources listed in the absence of final range maps from EPA and

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[21] Frank AR. 2015. Listed Species Data Aggregated by the FIFRA Endangered Species Task Force – 2013 and 2014 Updates. Project Number 13716. FIFRA Endangered Species Task Force (FESTF), Lakewood, WA. MRID 49643402.

[22] Ibid

[23] Ibid

[24] Ibid

the USFWS, FESTF created a feature class combining sub-county layers with aggregated county-level spatial data. Only sub-county species location data were used for counties where this was available. The majority of sub-county spatial location data used for range data consisted of EOs from FESTF's licensed dataset from NatureServe (2014). Locations of designated critical habitat were also included in the range data as obtained from the data source listed below. The range maps developed as part of this case study are considered to be "best available" species range data in absence of range maps from EPA/USFWS. The data sources utilized on the species range maps consisted of the following.

US EPA EFED
Species/county records were received by FESTF from EPA's LOCATES database on multiple dates in January, 2014.

US FWS
USFWS Threatened and Endangered Species by County Lists were obtained from US FWS websites and confirmed by each USFWS Regional Office on or before May 15, 2014 as the best available information for AK, CA (Sacramento and Klamath Offices), CT, IL, IN, MA, MI, MN, MO, NH, NY, OH, PA, PR, RI, VT, WV, and WI. All other states indicated that the most up-to-date information should be obtained from the Information, Planning, and Conservation System (IPaC); species/county records were obtained from IPaC on August 29, 2014. Additionally, a complete list of species/county records was obtained from the FWS ECOS helpdesk.

NMFS
Feature classes for listed species under NMFS jurisdiction were received on July 13, 2011 (confirmation from NMFS was received that these were the most up-to-date information available) and overlaid on county boundaries (from US Census Bureau, 2010). In addition, per EPA and NMFS's advice, NMFS-regional species boundary maps for Steelhead and Salmon species (Coho, Chinook, Atlantic, Sockeye, and Chum) and the Atlantic salmon, Gulf of Maine DPS were obtained from the NMFS website (http://www.nmfs.noaa.gov/gis/data/listed.htm) and overlaid on county boundaries to produce species/county records which were added to FESTF's aggregated dataset.

NatureServe
Element Occurrences (EOs)[25] from FESTF's licensed NatureServe dataset, received on July 31, 2014, were overlaid on county boundaries and the resulting list incorporated into FESTF's aggregated dataset. Additionally, each Natural Heritage Program contributing to NatureServe's Multi-Jurisdictional Database tracks the county(ies) in which an EO occurs and reports this in tabular format. This species by county(ies) list, which is a part of FETSF's licensed dataset from NatureServe, is also incorporated into FESTF's aggregated dataset. Because known data gaps

[25] For more information about Element Occurrences, see the NatureServe website at http://www.natureserve.org/conservation-tools/standards-methods/element-occurrence-data-standard.

exist in FESTF's licensed dataset (see MRID 49643402 for details about known data gaps)[26] a species/county list obtained from NatureServe for all federally listed species locations in NatureServe's Central Databases was obtained on July 31, 2014.

Critical Habitat
County locations for species with designated critical habitat as of October 20, 2014 were compiled from Federal Register Notices designating critical habitat for each species. Spatial data for species under USFWS's jurisdiction was obtained from the USFWS ECOS Critical Habitat Portal[27] (accessed July 30, 2014). Spatial data for species under NMFS's jurisdiction was obtained from the NOAA website[28] (accessed July, 2015).

Use Sites
The universe of use sites for each OP was obtained from materials provided to FESTF by members supporting the three OPs. These resources comprised a master label developed by FESTF-member malathion registrants, a study by Solomon et al. (2014)[29] for a master list of chlorpyrifos uses registered by Dow AgroSciences (including Special Location Needs labels (SLNs, FIFRA section 24c) for specific States in the U.S. that are based upon these products), and a master label developed by FESTF-member diazinon registrants. These resources were used to compile a complete list, for each of the three OPs, of all uses supported by FESTF-member OP registrants. This included agricultural and non-agricultural uses. Geographic use restrictions and other application details were noted for each supported use site for each OP.

County-level co-occurrence analysis
Species ranges described above were compared to agricultural use sites in the FESTF Information Management System (IMS) and a list of species-county co-occurrences was generated for each OP. The FESTF IMS contains agricultural data from the USDA Census of Agriculture and each agricultural use site was matched to the appropriate Census of Agriculture (2012) site(s).

Species presence by Regional HUC
Species presence by county was determined from the species range data described above. However, species presence by hydrological regional boundary (HUC 2; obtained from the USGS website (https://water.usgs.gov/GIS/huc.html) was determined using a more conservative

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[26] Frank AR. 2015. Listed Species Data Aggregated by the FIFRA Endangered Species Task Force – 2013 and 2014 Updates. Project Number 13716. FIFRA Endangered Species Task Force (FESTF), Lakewood, WA. MRID 49643402.
[27] https://ecos.fws.gov/ecp/report/table/critical-habitat.html
[28] http://www.nmfs.noaa.gov/pr/species/criticalhabitat.htm
[29] Solomon, K. R., Williams, W. M., Mackay, D., Purdy, J., Giddings J. M., & Giesy, J. P. (2014). Properties and Uses of Chlorpyrifos in the United States. In J. P. Giesy & K. R. Solomon (Eds.), Ecological Risk Assessment for Chlorpyrifos in Terrestrial and Aquatic Systems in the United States of the Series Reviews of Environmental Contamination and Toxicology. Volume 231. (13-34). New York: Springer.

county-level analysis. If any part of a species' range overlapped any part of a given county, presence across the entire county was assumed. Then counties were matched to HUC 2 using a spatial overlay of county boundaries on HUC regional boundaries. Species presence by county was then compared to the HUC 2 presence by county to obtain a list of species presence by HUC 2.

Aquatic Habitat Bins

For each federally listed species, FESTF maintains a lifeform designation of "Terrestrial," "Aquatic," or "Both" which is assigned by reviewing available biological attribute data and determining the appropriate habitat type for each species. Each listed species with lifeform designation of *Aquatic* or *Both* was assigned to aquatic habitat bins based upon the classification system designed by Corbin *et al.* 2014[30]. Aquatic habitat bins were assigned based on available information from FESTF's licensed dataset from NatureServe, USFWS, and NMFS. If additional details regarding species' habitat requirements were needed, other reputable sources such as the International Union for Conservation of Nature (IUCN) or calflora.org were consulted.

Many species had characteristics that classified them into more than one habitat bin; in such instances, all of the appropriate habitat bins were assigned. Additionally, species with life stages associated with specific habitat bins were identified and habitat bins were assigned to each life stage as needed. The logic for assigning a particular habitat bin was as follows: (1) *aquatic-associated terrestrial* = terrestrial habitats adjacent to or associated with aquatic habitats, or an aquatic species that also utilizes terrestrial habitats (riparian zone, at the base of a waterfall, meadow adjacent to a wetland); (2) *low flow* = where current is barely discernable in a low volume body of water (trickling spring, still pool within a stream, shallow areas at stream edges); (3) *moderate flow* = intermediate current in a small to moderate-volume body of water (stream, creek, low flow areas during flooding); (4) *high flow* = fast current in a moderate to large volume body of water (river, rapids area of a creek, moderate flow areas subject to flooding); (5) *low volume* = very small body of water – usually ephemeral, or the shallow edges of a moderate volume or high volume body of water (puddle, edge of a pond); (6) *moderate volume* = intermediate-sized body of water (pond, wetland, vernal pool), (7) *high volume* = large body of water (lake, extensive wetland, vernal pool covering many acres); (8) *intertidal nearshore* = marine environment directly adjacent to the coast (salt marsh, land/substrate that becomes uncovered during low tide); (9) *subtidal nearshore* = coastal marine environment where water is deep and larger species (other than small fish and crustaceans) can be found; (10) *offshore marine* = open ocean away from the coast.

Crop Footprints

Crop footprints represent the spatial extent of agricultural use sites for a given pesticide. Crop footprints are based on the five most recent years of Cropland Data Layer (CDL) data available,

[30] Corbin, M., D. Crane, T. Hawkes, K. Myers and C. Peck. 2014. Using generic aquatic habitats to estimate pesticide exposure to threatened and endangered species. Presented at the Society of Environmental Toxicology and Chemistry, Vancouver, BC.

starting with 2010 (at the time of this analysis, CDL data for 2014 was the most recent available and therefore, 2010-2014 CDL were used in this analysis). A national CDL layer is available for 2009; however, it was based on lower resolution imagery (56-m) before being resampled to the now standard 30-m resolution. Labeled uses for each OP described above were cross-walked to the appropriate crop(s) in the CDL and then grouped based on the crop groups defined by EPA in "CDL to Crop Group Crosswalk, Document provided to FESTF by EPA (Steven Lennartz) on November 14, 2014" found at the end of this Attachment. Any geographic use directions or restrictions (such as "Not labeled for use in MS") were considered and the corresponding crop(s) in that area were removed from the footprint. Presence in any of the CDL layers for a given labeled crop resulted in presence for that crop in the crop group footprint. This approach differs from that outlined by EPA[31] in that (1) it does not include expansion, or "region growing" into adjacent cultivated land because FESTF believes that process introduces unacceptable errors, and (2) crops not labeled for use, as well as geographic restrictions on the label, were removed from the appropriate footprint.

For chlorpyrifos and malathion, FESTF developed formulation-specific crop footprints. These represent the uses supported by FESTF-member registrants for each formulation and take into consideration geographic use restrictions. Formulation-specific crop group footprints developed for chlorpyrifos and malathion are listed in the Table 1 below.

Table 1. Chlorpyrifos and Malathion Crop Group Footprints Developed by FESTF by Formulation

Crop Group	Chlorpyrifos Formulation(s)	Malathion Formulation(s)
Corn	Flowable; Granular	ULV; EC
Cotton	Flowable	ULV; EC
Orchard/Vineyard	Flowable; Granular	ULV; EC
Other crops	Flowable	ULV; EC
Other row crops	Flowable; Granular	EC
Pasture/Hay/Forage/Grass	Flowable; Granular	ULV; EC
Soybeans	Flowable; Granular	N/A[1]
Rice	N/A[1]	ULV; EC
Vegetables and ground fruit	Flowable; Granular	ULV; EC
Wheat	Flowable	ULV; EC
Other grains	Flowable; Granular	ULV; EC
Other Tree	Flowable	N/A[1]

[1]Not applicable because none of the uses in the crop group are supported by a FESTF-member registrant.

[31] Presentation entitled "Geospatial Data for Mapping Pesticide Use Patterns" by Steve Lennartz (EPA) from the Assessing Risks to Endangered and Threatened Species from Pesticides - 4th Interagency Workshop on Joint Interim Approaches to NAS Recommendation public workshop on April 15, 2015.

Two crop group footprints were developed to spatially represent the extent of diazinon use in agricultural crops: Vegetables and ground fruit and Orchard/Vineyard.

Non-crop Footprints

The FESTF case study also assisted in the development of a footprint representing the spatial extent of malathion used for mosquito control. Application of ULV mosquito adulticide requires certified applicators and specialized equipment managed by dedicated Mosquito Control Districts and other state/municipal departments of public health which can therefore be very informative to the development of a spatial footprint representing spatial extent of malathion mosquito adulticide use. Reported sales and use data obtained by the American Mosquito Control Association,[32] Cheminova, and from publicly-available data in Florida and California was utilized to determine areas of potential malathion adulticide use. This resulted in a spatial footprint covering 159 counties where applications had been reported by one of these sources in the county as well as 514 adjacent/neighboring counties to account for potential drift.

There are other non-crop/non-agricultural uses of malathion, chlorpyrifos, and diazinon being supported by FESTF-member registrants but spatial footprints representing extent of these have not been developed as part of the FESTF case study.

Species habitat descriptions

FESTF's aggregated species attribute databases (see MRID 48969506 and 49643402) and additional data sources, such as recently published 5-year Reviews, Recovery Plans and other USFWS/NMFS documents were utilized to develop habitat descriptions for each species considered in this analysis. Habitat descriptors were analyzed for components that would preclude exposure to each of the three OPs and are being provided as part of this analysis.

Natural history, diet, life cycle

FESTF's aggregated species attribute databases were also reviewed for components of species diet, natural history, and life cycle that would either preclude exposure or are otherwise relevant to the analysis of use of each of the three OPs in relation to ESA-listed species. These details are also being provided as part of this analysis.

Species occurrence on Federal lands

Sub-county species locations from FESTF's licensed dataset from NatureServe and designated critical habitat spatial data were overlaid on Federal and Indian land boundaries obtained from USGS[33] to determine landholder information. For those species and species locations residing wholly on lands administered by the Federal Government or on Indian lands, landholder details were collected and are being provided as a work task. Species residing on Federal and Indian lands are afforded protection by the corresponding landholder through federal requirements related to NEPA or other federal and state laws.

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[32] Conducted by Angela Beehler of the Benton Co., WA Mosquito Control District; results have been submitted to the EPA.

[33] Available at www.nationalatlas.com.

Documentation and Findings

The various work tasks, data collection and analysis efforts described above are recorded and documented into FESTF's Information Management System (IMS). The FESTF IMS provides a platform for documenting findings, uploading references and other relevant pieces of information. It also provides an efficient way to deliver/submit assessment results. Various queries and summary tables are provided in the FESTF IMS for efficient and flexible review of the results. As FESTF completes the remaining work tasks in this case study, documentation will be recorded in the FESTF IMS for use by the EPA and FESTF-member registrants to inform the assessment process.

CDL to Crop Group Crosswalk, Document provided to FESTF by EPA (Steven Lennartz) on November 14, 2014

These classes are not mutually exclusive to one another, and are further reclassed into 11 ag classes.

Corn: 10, 14, 15, 18

Cotton: 20, 25, 26, 42

Rice: 30

Soybeans: 40, 42, 45, 48, 14

Wheat: 50, 56, 58, 15, 25, 45

Veg & GF: 60, 61, 68, 26, 56

Orchards & Vineyards: 70

Other Grains: 80

Other Row Crops: 90

Other Crops: 100

Pasture/Hay: 110

Summary of CDL General Classes

Reclass Value	CDL General Class
10	Corn
14	Corn/soybeans
15	Corn/wheat
18	Corn/grains
20	Cotton
25	Cotton/wheat
26	Cotton/vegetables
30	Rice
40	Soybeans
42	Soybeans/cotton
45	Soybeans/wheat
48	Soybeans/grains
50	Wheat
56	Wheat/vegetables
58	Wheat/grains
60	Vegetables and ground fruit
61	(ground fruit)
68	Vegetables/grains
70	Orchards and grapes
75	Other trees
80	Other grains
90	Other row crops
100	Other crops
110	Pasture/hay/forage
121	Developed - open
122	Developed - low
123	Developed - med
124	Developed - high

Summary of CDL General Classes

Reclass Value	CDL General Class
140	Forest
150	Grassland
160	Shrubland
180	Water
190	Wetlands - woods
195	Wetlands - herbaceous
200	Miscellaneous land

Cross-walk between CDL class, general land cover classes, and land cover classes for curve number

CDL_VAL	CDL_CLASS_NAME	Gen_Class
1	Corn	Corn
2	Cotton	Cotton
3	Rice	Rice
4	Sorghum	Other grains
5	Soybeans	Soybeans
6	Sunflower	Other row crops
10	Peanuts	Other row crops
11	Tobacco	Other row crops
12	Sweet Corn	Vegetables and ground fruit
13	Pop or Orn Corn	Vegetables and ground fruit
14	Mint	Vegetables and ground fruit
21	Barley	Other grains
22	Durum Wheat	Wheat
23	Spring Wheat	Wheat
24	Winter Wheat	Wheat
25	Other Small Grains	Other grains
26	Dbl Crop WinWht/Soybeans	Soybeans/Wheat

Summary of CDL General Classes

Reclass Value		CDL General Class
27	Rye	Other grains
28	Oats	Other grains
29	Millet	Other grains
30	Speltz	Other grains
31	Canola	Other grains
32	Flaxseed	Other grains
33	Safflower	Other grains
34	Rape Seed	Other grains
35	Mustard	Vegetables and ground fruit
36	Alfalfa	Pasture/hay/forage
37	Other Hay/Non Alfalfa	Pasture/hay/forage
38	Camelina	Other grains
39	Buckwheat	Other grains
41	Sugarbeets	Other row crops
42	Dry Beans	Vegetables and ground fruit
43	Potatoes	Vegetables and ground fruit
44	Other Crops	Other crops
45	Sugarcane	Other grains
46	Sweet Potatoes	Vegetables and ground fruit
47	Misc Vegs & Fruits	Vegetables and ground fruit
48	Watermelons	Vegetables and ground fruit
49	Onions	Vegetables and ground fruit
50	Cucumbers	Vegetables and ground fruit
51	Chick Peas	Vegetables and ground fruit
52	Lentils	Vegetables and ground fruit
53	Peas	Vegetables and ground fruit
54	Tomatoes	Vegetables and ground fruit

Summary of CDL General Classes

Reclass Value		CDL General Class
55	Caneberries	Vegetables and ground fruit
56	Hops	Other row crops
57	Herbs	Vegetables and ground fruit
58	Clover/Wildflowers	Other crops
59	Sod/Grass Seed	Other crops
60	Switchgrass	Pasture/hay/forage
61	Fallow/Idle Cropland	Other crops
62	Pasture/Grass	Pasture/hay/forage
63	Forest	Forest
64	Shrubland	Shrubland
65	Barren	Miscellaneous land
66	Cherries	Orchards and grapes
67	Peaches	Orchards and grapes
68	Apples	Orchards and grapes
69	Grapes	Orchards and grapes
70	Christmas Trees	Other trees
71	Other Tree Crops	Orchards and grapes
72	Citrus	Orchards and grapes
74	Pecans	Orchards and grapes
75	Almonds	Orchards and grapes
76	Walnuts	Orchards and grapes
77	Pears	Orchards and grapes
81	Clouds/No Data	Miscellaneous land
82	Developed	Developed - unspec
83	Water	Water
87	Wetlands	Wetlands - herbaceous
88	Nonag/Undefined	Miscellaneous land

Summary of CDL General Classes

Reclass Value		CDL General Class
92	Aquaculture	Other crops
111	Open Water	Water
112	Perennial Ice/Snow	Miscellaneous land
121	Developed/Open Space	Developed - open
122	Developed/Low Intensity	Developed - low
123	Developed/Med Intensity	Developed - med
124	Developed/High Intensity	Developed - high
131	Barren	Miscellaneous land
141	Deciduous Forest	Forest
142	Evergreen Forest	Forest
143	Mixed Forest	Forest
152	Shrubland	Shrubland
171	Grassland Herbaceous	Grassland
176	Pasture/Hay	Pasture/hay/forage
181	Pasture/Hay	Pasture/hay/forage
190	Woody Wetlands	Wetlands - woods
195	Herbaceous Wetlands	Wetlands - herbaceous
204	Pistachios	Orchards and grapes
205	Triticale	Other grains
206	Carrots	Vegetables and ground fruit
207	Asparagus	Vegetables and ground fruit
208	Garlic	Vegetables and ground fruit
209	Cantaloupes	Vegetables and ground fruit
210	Prunes	Orchards and grapes
211	Olives	Orchards and grapes
212	Oranges	Orchards and grapes
213	Honeydew Melons	Vegetables and ground fruit

Summary of CDL General Classes

Reclass Value		CDL General Class
214	Broccoli	Vegetables and ground fruit
216	Peppers	Vegetables and ground fruit
217	Pomegranates	Orchards and grapes
218	Nectarines	Orchards and grapes
219	Greens	Vegetables and ground fruit
220	Plums	Orchards and grapes
221	Strawberries	Vegetables and ground fruit
222	Squash	Vegetables and ground fruit
223	Apricots	Orchards and grapes
224	Vetch	Pasture/hay/forage
225	Dbl Crop WinWht/Corn	Corn/Wheat
226	Dbl Crop Oats/Corn	Corn/Grains
227	Lettuce	Vegetables and ground fruit
229	Pumpkins	Vegetables and ground fruit
230	Dbl Crop Lettuce/Durum Wht	Wheat/Vegetables
231	Dbl Crop Lettuce/Cantaloupe	Vegetables and ground fruit
232	Dbl Crop Lettuce/Cotton	Cotton/Vegetables
233	Dbl Crop Lettuce/Barley	Vegetables/Grains
234	Dbl Crop Durum Wht/Sorghum	Wheat/Grains
235	Dbl Crop Barley/Sorghum	Other grains
236	Dbl Crop WinWht/Sorghum	Wheat/Grains
237	Dbl Crop Barley/Corn	Corn/Grains
238	Dbl Crop WinWht/Cotton	Cotton/Wheat
239	Dbl Crop Soybeans/Cotton	Soybeans/Cotton
240	Dbl Crop Soybeans/Oats	Soybeans/Grains
241	Dbl Crop Corn/Soybeans	Corn/Soybeans
242	Blueberries	Vegetables and ground fruit

Summary of CDL General Classes

Reclass Value		CDL General Class
243	Cabbage	Vegetables and ground fruit
244	Cauliflower	Vegetables and ground fruit
245	Celery	Vegetables and ground fruit
246	Radishes	Vegetables and ground fruit
247	Turnips	Vegetables and ground fruit
248	Eggplants	Vegetables and ground fruit
249	Gourds	Vegetables and ground fruit
250	Cranberries	Vegetables and ground fruit
254	Dbl Crop Barley/Soybeans	Soybeans/Grains